

The Journal of Allergy

VOL. 21

JANUARY, 1950

No. 1

American Academy of Allergy

Fifth Annual Meeting, Atlantic City, N. J., Dec. 6-8, 1948

(Continued)

AN EXPERIMENTAL APPROACH TO PSYCHOSOMATIC PHENOMENA IN RHINITIS AND ASTHMA*†

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FIRST I would like to express my pleasure at being here with this distinguished group. I am honored to have been selected to deliver a lecture in memory of Dr. Lamson.

In discussing a presentation of Dr. Robert Ward Lamson in this city six years ago on the pulmonary pathology of asthma your present treasurer, Dr. Horace Baldwin, stated, and I quote, "I wonder, when we come down to the ultimate solution of this, if we will not be faced with the fact that it is the pattern of respiratory response that counts rather than the etiological factor per se."

During the past few years there has been a rapidly growing concept in medicine that pathophysiologic processes and what we customarily classify as syndromes or diseases are not necessarily attributable to one etiologic agent. It is becoming increasingly clear that the same biologic pattern may be called forth in response to a variety of noxious experiences. Much of the development of our understanding of the concept of the nonspecific tissue response has rested upon experimental work in allergy. Recently the studies of Hans Selye and others have established pretty clearly that disease processes occur as biologic patterns of defense set in motion by a variety of specific and nonspecific threats to the integrity of the organism. Even the Aschoff body, long considered pathognomonic of rheumatic fever, has been identified in numerous other infectious and degenerative situations.¹ Of late there is gathering evidence that even symbolic noxae, that is, words or events which threaten the security of the individual by reason of earlier conditioning experiences, may initiate pathophysiologic reactions and lead to structural organic disease.

Aided by grants from the Commonwealth Fund and the Estate of Lester N. Hofheimer.

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†Presented as the Robert Ward Lamson Lecture at the Fifth Annual Meeting of the American Academy of Allergy, Atlantic City, December 6, 1948, by Dr. Stewart Wolf.

Some of these psychosomatic phenomena are familiar day-to-day experiences. Until recently they have been generally looked upon as functional, reversible, and without significance as regards organic or structural disease. Now, however, evidence is accumulating that a structural disease process such as peptic ulcer, for example, which may lead to serious disability and death, often involves chiefly a psychosomatic process set in motion by symbolic noxae. Then the testimony of our language that "you make me sick to my stomach" takes on added significance.

How far can psychosomatic processes go in producing bodily disturbances and wherein do they affect the respiratory tree? We speak of getting things off our chests, holding our breath in anticipation, and having the breath scared out of us! How much real pathology do these homely statements reflect? I will try to present to you briefly some of our own evidence on this point from experimental studies carried on at Cornell-New York Hospital and reported in detail in a separate monograph.²

As regards the nose, our initial observations were extremely simple and involved merely a careful study of the appearance of the mucous membranes of the nasal septum and turbinates through a warmed nasal speculum with special reference to color, swelling, secretion, and obstruction. Some 5000 such observations were made on nearly 200 subjects repeatedly for periods of a few days to four years.

EFFECTS OF NOXIOUS STIMULI

In experimental sessions, after establishing a base line for nasal function, subjects were exposed to a series of graded threats beginning with those directed specifically at the nasorespiratory passages.

A.—Irritant Fumes

Inhalation for one minute of ammonium carbonate provoked the expected reaction; namely, after inhalation, sudden hyperemia, swelling of the nasal structures with hypersecretion and obstruction. Associated with these nasal changes there occurred lacrimation and spasm of the eyelids, as well as strenuous coughing (Fig. 1).

Comment.—This was obviously a reaction of defense on the part of the organism, an effort at shutting out, washing away, neutralizing, and ejecting the offending substance.

B.—Pollen

Another type of assault against the person arises from the inhalation of pollens to which he may be sensitive. Accordingly, a subject was studied in an attack of hay fever. Prior to the attack, the septum and turbinates were of comparatively pale color and of normal appearance. Immediately upon beginning to cut flowers in his garden, however, the subject began to weep and sneeze. His membranes had become hyperemic, wet, and swollen (Fig. 2).

Comment.—This particular attack was an abortive one, but it was frequently observed that when the swelling of the membranes was sustained, the hyperemia subsided, leaving the membranes pale but swollen, wet, and edematous-looking. This pale, swollen state is the usual appearance of the nose of the hay fever sufferer when he comes to the doctor's office for treatment. It is clear,

however, that, as in the case of inhalation of irritating fumes, the hyperemia comes first. This thus appears to be another situation in which the defensive bodily reaction of shutting out and washing away may be invoked.

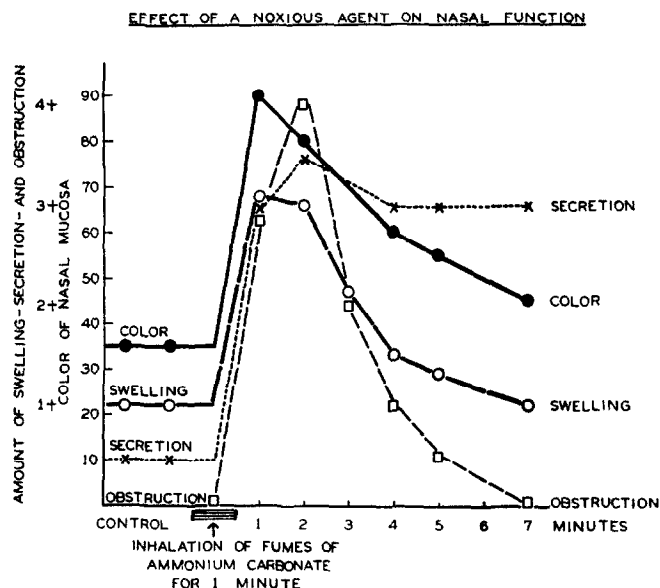


Fig. 1.—Hyperemia with swelling, hypersecretion, and obstruction of the nose following inhalation of a noxious chemical agent, ammonium carbonate.

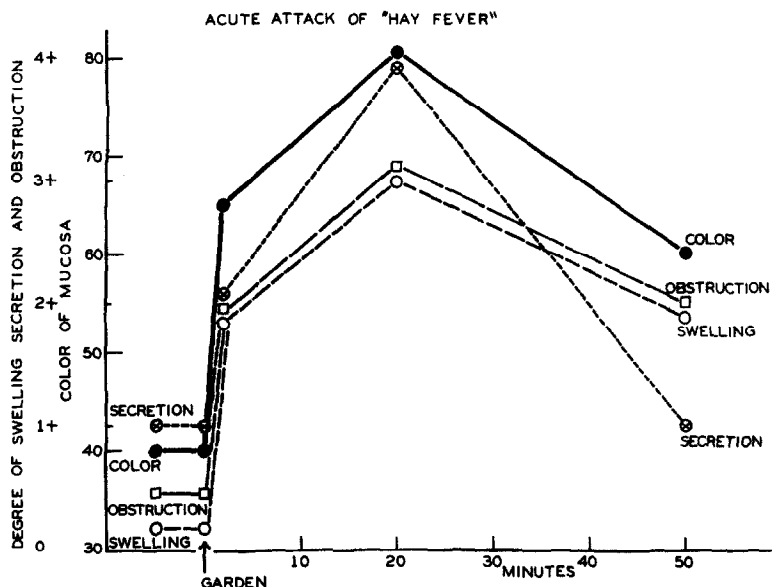


Fig. 2.—Hyperemia, swelling hypersecretion, and obstruction in the nose during an abortive acute attack of hay fever.

C.—Pain

The next step was to inflict upon the experimental subject a nonspecific threat, not directed at his respiratory passages. Accordingly, an intense headache was induced by constricting the head in a tight-fitting steel crown. This

was a highly unpleasant experience, associated with feelings of apprehension on the part of the victim, and gave rise to the same reaction of defense as that described above for more specific threats to the nose (Fig. 3).

D.—Word Symbols

The final step was to learn whether or not symbolic threats which did not involve the application of physical trauma would induce such a pattern of defense with nasal changes.

A sufferer from chronic rhinitis whose nasal structures at the time of observation were normal was forcibly reminded that he was caught in the toils of an unfavorable marriage, that his wife was using him for a meal ticket and giving him nothing in return. He promptly began to display the same evidences of nasal hyperfunctioning as noted above and there was an almost complete obstruction to breathing. He described himself as being on the verge of tears although weeping did not occur. After the discussion was ended, the subject was reassured and diverted and after another hour the nasal functions returned toward normal (Fig. 4).

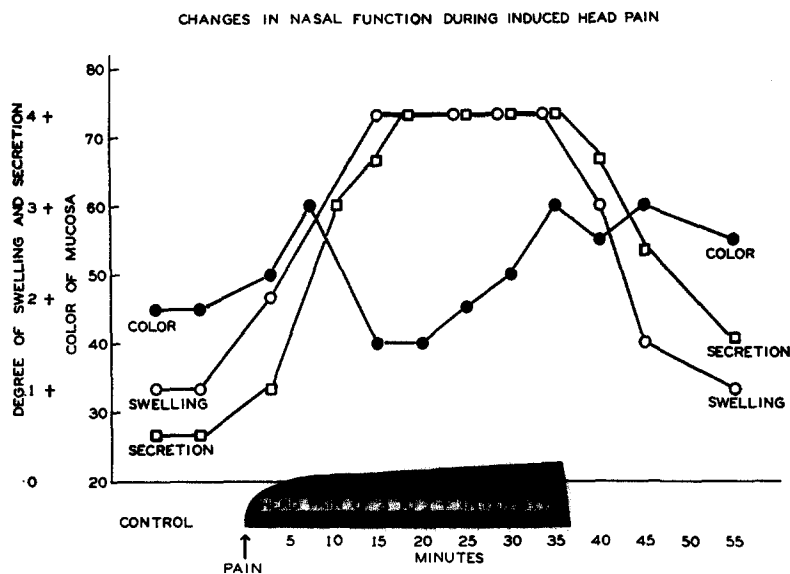


Fig. 3.—Hyperemia, hypersecretion, and obstruction in the nose during induced headache—nasal reaction to pain.

Comment.—The association of nasal hyperfunction to weeping was frequently observed. The fact that the tears pass into the nose through the nasolacrimal duct may be of some significance with regard to the nasal changes which accompany weeping, but it seems unlikely that the chemical composition of tears is sufficiently irritating to produce hyperemia and swelling, and indeed the changes in the nose often occurred without actual lacrimation. Lacrimation, like nasal hypersecretion, serves to wash away particles and to dilute noxious agents. The origin of these phenomena may be related in some way to weeping in infancy and occur as part of a conditioned response. The individual may learn to adapt a physiologic pattern appropriate against noxae in the air about

him to protect himself from other threats and to gain sympathy and support. As in dealing with noxious gases and dust, the infant may find the behavior pattern built around weeping an effective method of gaining succor from a hostile environment. As the individual grows older, he may perpetuate the weeping pattern as a way of life, despite the fact that it becomes progressively less effective and inappropriate as protection against symbolic threats and assaults. Perhaps this concept will answer Tennyson's query, "Tears, idle tears, we know not what they mean." The complete weeping pattern, involving both the eye and the nose, often persists in females into adult life. In adult males, however, from the impact of cultural conditioning, the pattern becomes fragmented. While frank weeping is seldom manifest, hyperfunction in the nose may be readily evoked.

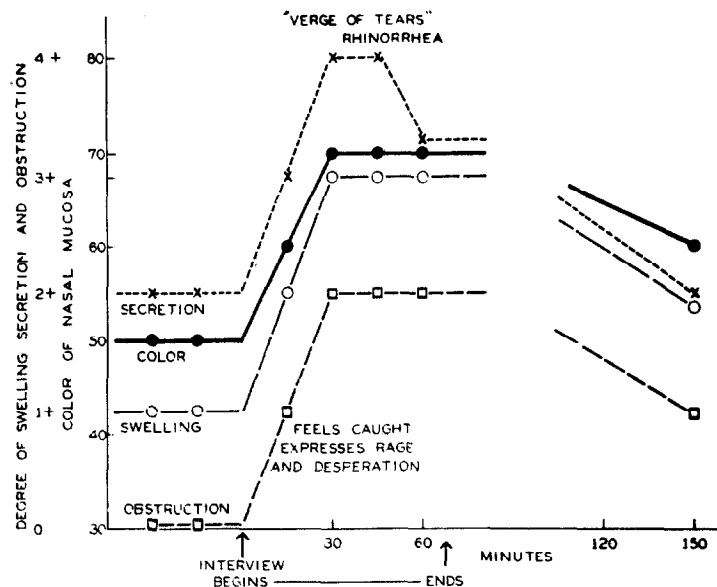
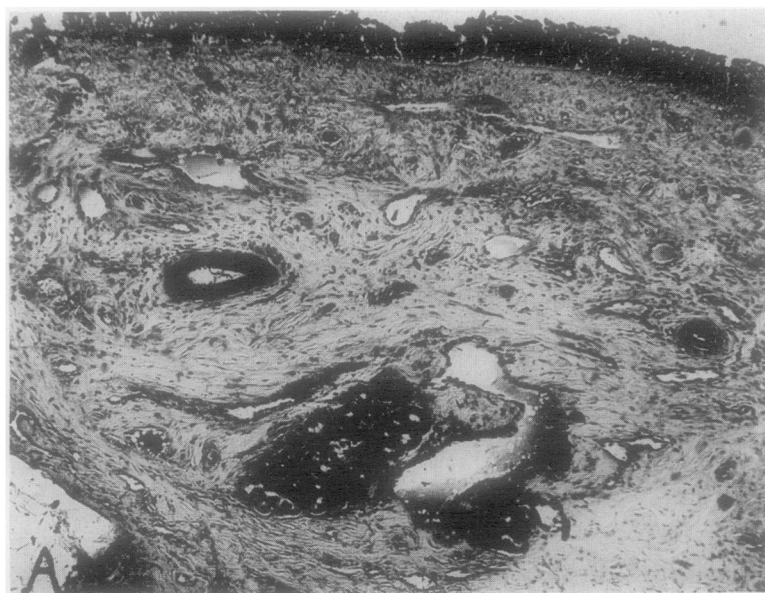


Fig. 4.—Experimentally induced hyperemia, swelling, hypersecretion, and obstruction in the nose during an interview in which the subject experienced anger and resentment.

STRUCTURAL TISSUE CHANGES AND CELLULAR REACTIONS

Biopsy of Turbinates

In an attempt to explore the characteristics of the tissue change and its mechanisms, a biopsy was made from the inferior turbinate of a sufferer from chronic rhinitis, first on one side during a control period of rest and relaxation, when the membranes were in an average state of activity, and again, from the opposite turbinate, at the height of a frustrating interview when the patient was on the verge of tears. Both biopsies were made with the same technique and the same topical cocaine anesthesia. The first section showed an essentially normal mucosal structure with moderate round-cell infiltration. The second revealed the mucous glands to be filled with secretion and the vascular and lymphatic channels to be prominent and dilated. The lighter stroma was indicative of edema (Fig. 5).



A.



B.

Fig. 5.—A, Biopsy of nasal mucosa during control period.

B, Biopsy of nasal mucosa during interview at height of nasal hyperfunction associated with emotional stress. Note engorgement of glandular structures and edema of the stroma.

Cell Counts of the Nasal Secretions

Nasal secretions of the subjects were collected and stained by an appropriately standardized technique before, during, and after the discussion of significant conflicts. At the same time white blood cell counts were made on the peripheral blood. It was found that nasal hyperfunction in association with

stress was accompanied by a marked eosinophilia locally and in the peripheral blood as well. The reaction is illustrated in Fig. 6. In this subject, as well as others, not only was an eosinophilic reaction observed in company with stress but a purulent response with the outpouring by the nasal membranes of polymorphonuclear leucocytes.

Tissue Fragility and Pain Threshold

Other evidences of "organic" tissue changes in response to symbolic threats to the integrity or welfare of the organism were found to be increased fragility

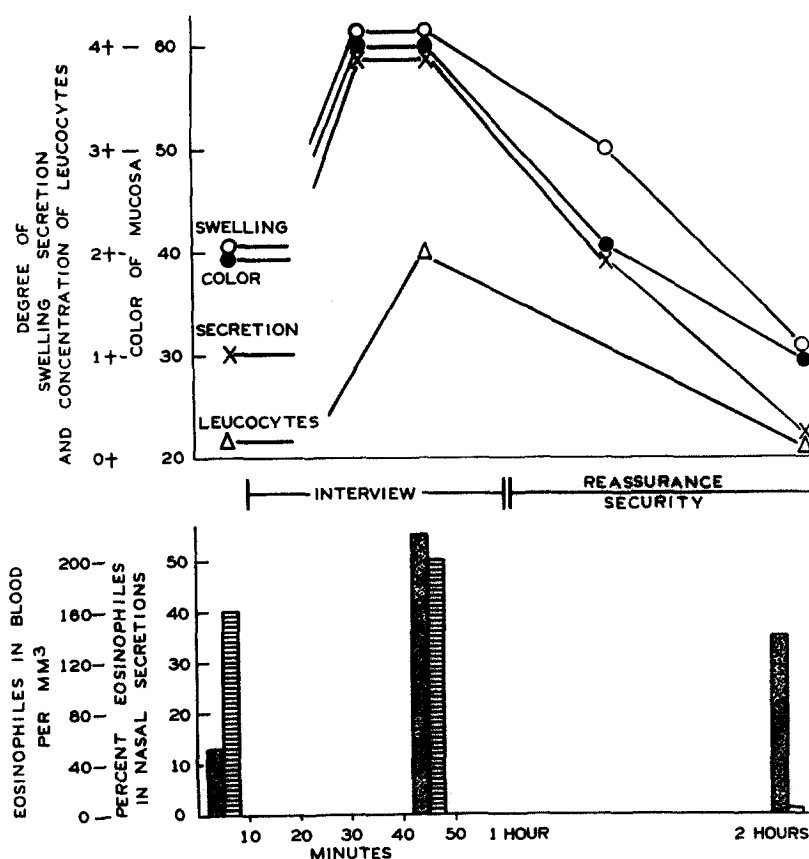


Fig. 6.—Cellular reaction locally and in peripheral blood; nasal hyperfunction during anger and humiliation.

of the membrane and lowered pain threshold accompanying sustained nasal hyperfunction. Ordinarily, when the membranes were in their average state, minor traumata with the nasal speculum were neither significantly painful nor productive of bleeding. Under circumstances of sustained hyperemia, however, the merest contact of speculum with turbinate was intensely painful and usually resulted in erosion and bleeding.

THE RELATIVE IMPORTANCE OF POLLEN AND LIFE SITUATION IN INDUCING NASAL HYPERFUNCTION AND EOSINOPHILIA

Since perhaps the most pathognomonic change attributed to allergy, eosinophilia, was observed in these patients it became especially interesting to com-

pare adverse life situations with pollens as to their effects on the eosinophilic reaction. Accordingly, several groups of subjects including those with strictly seasonal ragweed hay fever, those with nonseasonal vasomotor rhinitis but without ragweed skin sensitivity, and normal subjects without rhinitis and without skin sensitivity were selected and studied by the above methods. In addition, they were exposed to between 100 and 300 grains of mixed ragweed pollen circulating in the air of a special pollen room without their being aware of it. These experiments were carried out both in and out of ragweed hay fever season.

Fig. 7 illustrates an experiment on a 21-year-old girl who had had strictly seasonal ragweed hay fever. She was given an induced headache with the steel headband, an experience to which she submitted but vigorously resented. She

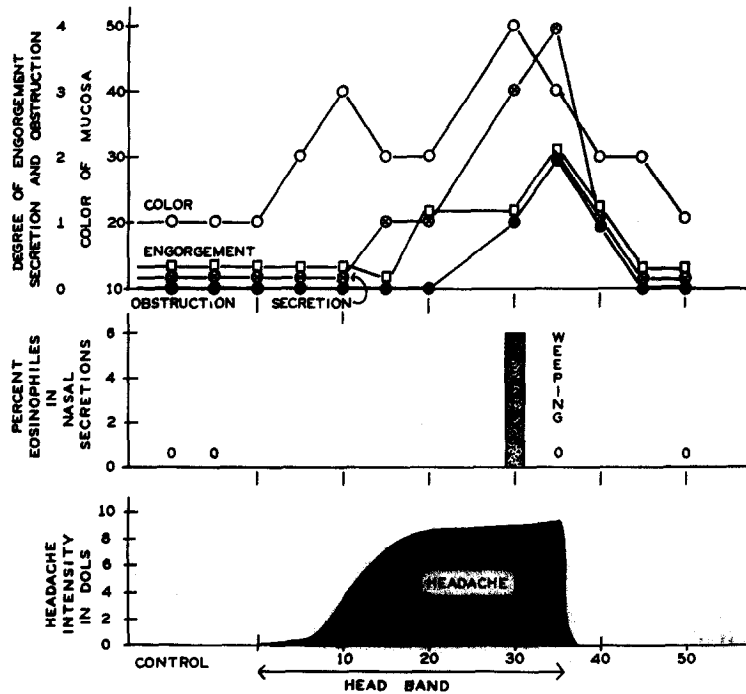


Fig. 7.—Production of eosinophilia in the nasal secretions with associated nasal hyperfunction by noxious stimulation of the head.

couldn't have been allergically sensitized to this experience since she had never had it before but nevertheless eosinophiles appeared in her nasal secretions in significant numbers.

As already noted (Fig. 6), the same type of reaction occurred in a discussion of significant personal conflicts during ragweed season but at a time when her nasal membranes were fairly normal and eosinophiles both in the nose and blood were at a low level.

Comment.—Generally speaking, when nasal function was average, neither “sensitive” nor “normal” subjects reacted to mixed ragweed pollen with sufficient evidence of nasal hyperfunction to produce symptoms. However, when there was pre-existing nasal hyperfunction from whatever cause, both groups

reacted to the pollen with marked hyperfunction, weeping, and sneezing. Thus, during difficult life situations productive of conflict, typical hay fever attacks followed pollen inhalation. Conversely, it was possible during pollen inhalation in the absence of frank hay fever to induce an attack by a discussion of significant personal problems and to induce subsidence of the attack by reassurance while the pollen is still being inhaled.

Fig. 8 illustrates an experiment on a 57-year-old Negro woman who also had ragweed sensitivity according to skin test but suffered from vasomotor rhinitis both in and out of season. She was interviewed in the pollen room. It will be noted that nasal hyperfunction was induced upon entering the pollen

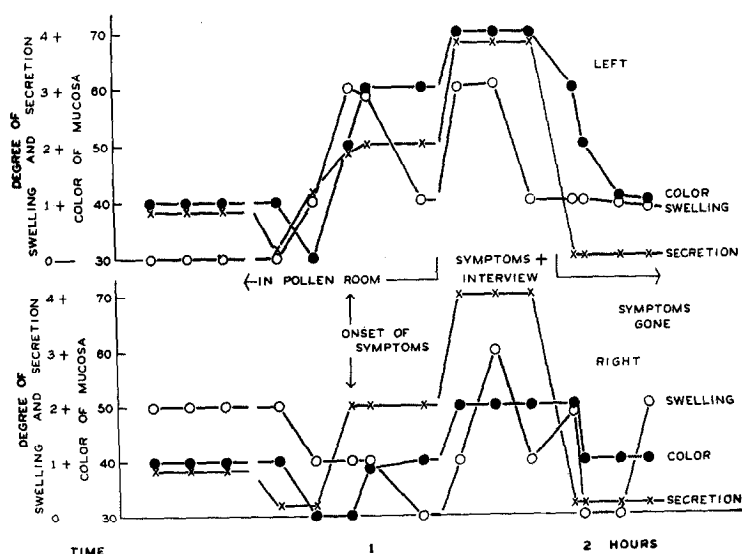


Fig. 8.—The occurrence of nasal hyperfunction during inhalation of pollen accentuated by a discussion of relevant personal conflicts and dissipated during reassurance with relaxation, although pollen inhalation continued.

room. It was apparently enhanced during the interview but finally subsided completely after successful reassurance and relaxation although she remained in the room with the same quantity of pollen circulating.

The next subject, shown in Fig. 9, had no ragweed sensitivity and never had symptoms of rhinitis except for occasional head colds. At such times, however, it was possible by adding further insult, either locally to her membranes or generally to her pride, to induce eosinophilia.

Comment.—From these data it would appear that the various factors provocative of nasal hyperfunction with symptoms of hay fever thus exert an additive effect.

NEURAL MECHANISMS INVOLVED

In an attempt to clarify the mechanism of these changes we subjected several individuals to unilateral Novocain block of the stellate ganglion. This maneuver eliminates the sympathetic impulses affecting the nasal membranes and allows the cholinergic fibers of the greater superficial petrosal nerve to act uninhibited.

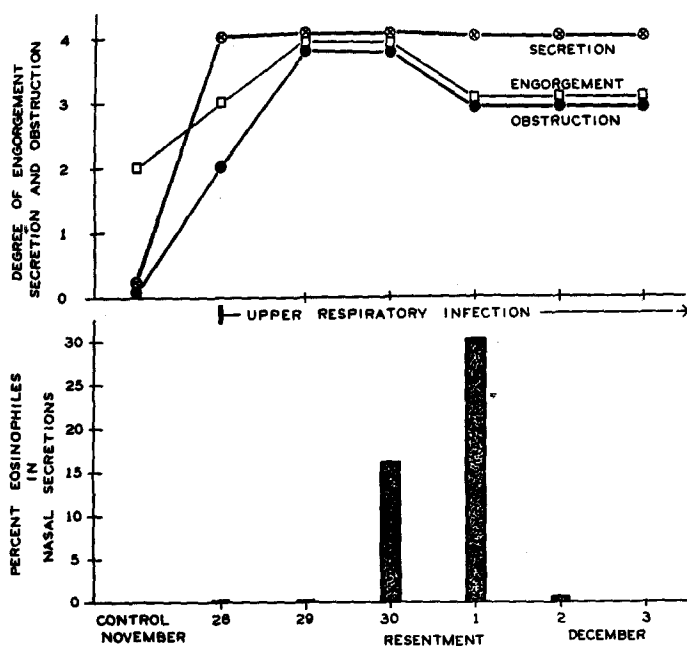


Fig. 9.—The additive effect of an upper respiratory infection and emotional stress in inducing eosinophilia in the nasal secretions.

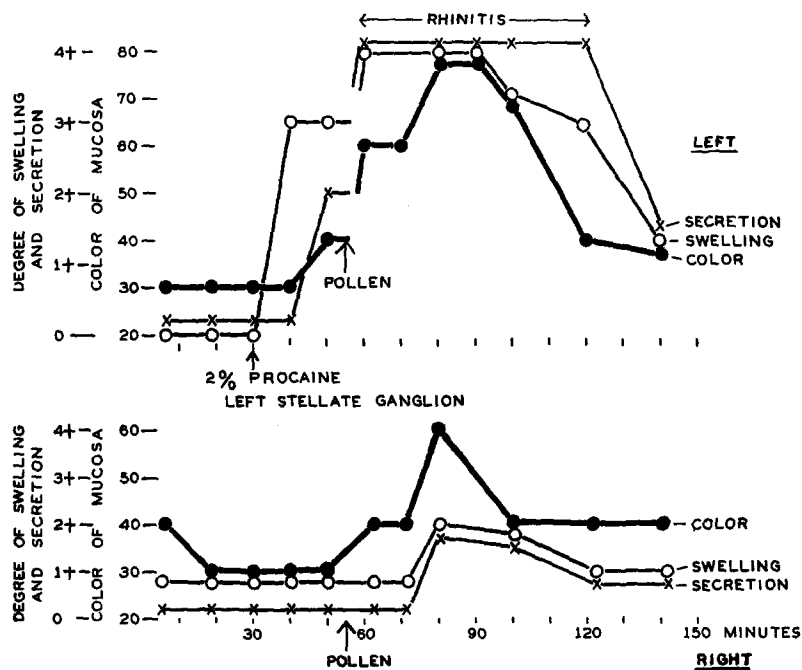


Fig. 10.—Nasal hyperfunction following procaine injection of the left stellate ganglion accentuated by the inhalation of pollen with the production of symptoms of rhinitis.

It was found that when the sympathetic supply of the nose was then interrupted by procaine injection of the stellate ganglion, the unopposed parasympathetic supply induced a state of moderate nasal hyperfunction. Such a partially denervated membrane was found to be even more reactive to noxious stimuli than usual (Fig. 10).

DISCUSSION

I have used up most of the time talking about rhinitis because I wanted to offer you our methods in some detail. Asthma was explored by similar techniques. The pathology of the two conditions is similar—membrane engorgement with edema, hypersecretion of mucus, and obstruction. The membranes of the nose and bronchi are continuous. Many of the patients had both diseases. In those with asthma it was equally possible to “turn on” and “turn off” attitudes by manipulating the interview situation. Detailed reports of such experiments are published elsewhere.^{2, 3}

The pattern of reaction involving the upper respiratory tree is, in essence, a defensive one of shutting out and washing away at the head end of the organism. It is appropriate and effective in dealing with an atmosphere of dust, smoke, or fumes but less so with an atmosphere of hostility from human beings. And yet, however inappropriate, it is quite obvious that it is invoked to deal with such threats and hazards. In fact, the various factors seem to work in concert and may set up a vicious cycle.

It seems likely that transitory nasal hyperfunction from whatever cause can be well tolerated by the organism, but sustained engorgement of tissues with obstruction not only led to pain and discomfort but also may have predisposed to the development of polypi and the establishment of infection locally in the nose and in the paranasal sinuses and bronchi.

CONCLUSION

The methods and direction of present studies have been reviewed. Certain inferences are already allowable, namely, that not only functional changes with associated troublesome symptoms, but also cellular reactions with eosinophilia and even structural tissue changes may be the end stage of psychosomatic processes set in motion by life experiences which, like allergens, have an especially noxious significance for the host.

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